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ENGINEERING CONSTRUCTION PROCEDURE

ECP 05-9531

CONTROL UNIT AND RTU INSTALLATION PROCEDURE

Network(s): EPN, SPN

Summary: This document details the installation procedure for the control units and remote terminal units (RTU) used with ground-mounted switchgear. It includes the physical installation of the control unit together with installation of the mains supply, earthing and communications.

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1 Introduction

1.1 This document details the installation procedure for the control units and remote terminal units (RTU) used with ground-mounted switchgear. It includes the physical installation of the control unit together with installation of the mains supply, earthing and communications.

1.2 This procedure shall be carried out in accordance with the requirements of the UK Power Networks Distribution Safety Rules.

1.3 This procedure shall be carried out having regard to the requirements and recommendations of the manufacturer. If conflict exists between the requirements of the manufacturer and those of UK Power Networks the matter shall be referred to Asset Management (or your UK Power Networks nominated contact).

2 Scope

2.1 This procedure applies to the following control units:

- Schneider T200E (aka Talus 200);
- Lucy Gemini 2 and 2.5.

2.2 The Remsdaq control units used in LPN are covered by procedure ECP 05-9535.

3 References

3.1 This procedure should be read in conjunction with the following references:

- UK Power Networks Distribution Safety Rules.
- Generic task risk assessments (internal document only).
- Schneider T200E User Manual.
- Lucy Gemini 2 Installation, Operation and Maintenance User Manual.
- Schneider RN2c-RN2-SE6-CE6 OEM Actuators Installation Instructions.
- ECP 11-0532 Schneider T200E Control Unit and RTU Commissioning Procedure (internal document only).
- ECP 11-0534 Lucy Gemini 2.5 Control Unit and RTU Commissioning Procedure (internal document only).
- ECP 11-0533 Schneider T200 Series 3 Control Unit and RTU Commissioning Procedure (internal document only).
- ECS 06-0023 Secondary Distribution Network Earthing Construction.
- EOS 05-9201 Paknet Communication System (internal document only).

4 Abbreviations and Definitions

4.1 The following abbreviations are used throughout this procedure.

Term	Definition
RTU	Remote Terminal Unit
SWBD	Switchboard

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5 Description

5.1 The Schneider T200E and Lucy Gemini 2 are control units/RTUs that are used to provide local and remote control of secondary switchgear. A description of these units is given in Appendix A.

5.2 New switchgear ordered with remote control will generally be supplied and delivered to site with the remote control already fitted. The list below shows some of the most popular configurations:

- RN2c – remote control on ring switch 1, FPI fitted to ring switch 1.
- RN6c – remote control on ring switch 1 and circuit-breaker, FPI fitted to ring switch 1.
- RE2c/SE6 – remote control on ring switch 1, ring switch 2 and SE6, FPI fitted to ring switch 1, ring switch 2 and SE6.
- RE2c/CE2 – remote control on ring switch 1, FPI fitted to ring switch 1 and ring switch 2.
- CE6 – remote control on circuit-breaker.
- VRN2a – remote control on ring switch 1, FPI fitted to ring switch 1.
- VRE2a/SSE – remote control on ring switch 1 and SSE, FPI fitted to ring switch 1, ring switch 2 and the SSE.

However on occasions it will be necessary to revise the as delivered arrangement, typically to facilitate mounting of the control unit onto the substation wall or a free standing frame, or to provide remote control for additional equipment installed later on site.

A number of additional components are required to carry out these tasks which are listed in Appendix E of this document for easy reference.

6 Equipment

6.1 The following test equipment is required:

- Vodafone Paknet Signal Strength Test Set CS1051 or CS106-6.
- Test lamp.
- 1kV insulation resistance tester (e.g. Megger).

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7 Communications

7.1 Prior to the installation of remote control switchgear it is advisable to carry out a Paknet communications survey using a Paknet test set (CS1051 or CS106-6) to determine if a suitable signal strength is available. If this cannot be achieved UK Power Networks Operational Telecoms (or your UKPN nominated contact) should be consulted so that an alternative can be established.

7.2 A Paknet aerial can usually be mounted onto the switchgear using the bracket supplied with the equipment - refer to examples in Figure 7-1 and Figure 7-2. For equipment that is installed in a GRP it is important to orientate the mounting bracket on the equipment to ensure the aerial is reasonably upright and not bent over by the GRP roof. It is often necessary to mount the aerial outside of the GRP to get the best reception - refer to Figure 7-3.

Figure 7-1 – Paknet Aerial Mounting on Schneider Switchgear

Figure 7-2 – Paknet Aerial Mounting on LUCY Switchgear

Figure 7-3 – Paknet Aerial Mounting on a GRP Substation

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8 Location

8.1 The RTU should be situated such that an operator has safe egress from the substation after operation which would usually mean a location near the main door of the substation.

8.2 Generally the Schneider T200E control unit is supplied mounted directly onto the switchgear which is satisfactory for most installations.

8.3 The Lucy VRN2a/VRE2a is supplied with the Gemini control unit mounted directly onto the ring main unit (RMU), above ring switch 2 cable end box. The control unit shall be removed and either mounted onto a suitable wall in the substation or onto the purpose-built free-standing frame (refer to 13.1Appendix C) which is supplied with the switchgear. **Note:** Care shall be taken to ensure that the conduit is able to reach the control unit from the RMU when positioning the control unit.

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9 Positioning and Configuration

9.1 The T200E can control up to four switches or circuit-breakers at any site, in any combination with either linear or rotary operation. For example, a substation may comprise of switchboard one (SWBD1) containing an RE2c where ring switch 1 and 2 and the coupled SE6 (linear operation) are all automated and in addition switchboard two (SWBD2) containing an RN2c where just ring switch 1 is automated. The diagrams shown in Figure 9-1 provide examples of the various remote control options.

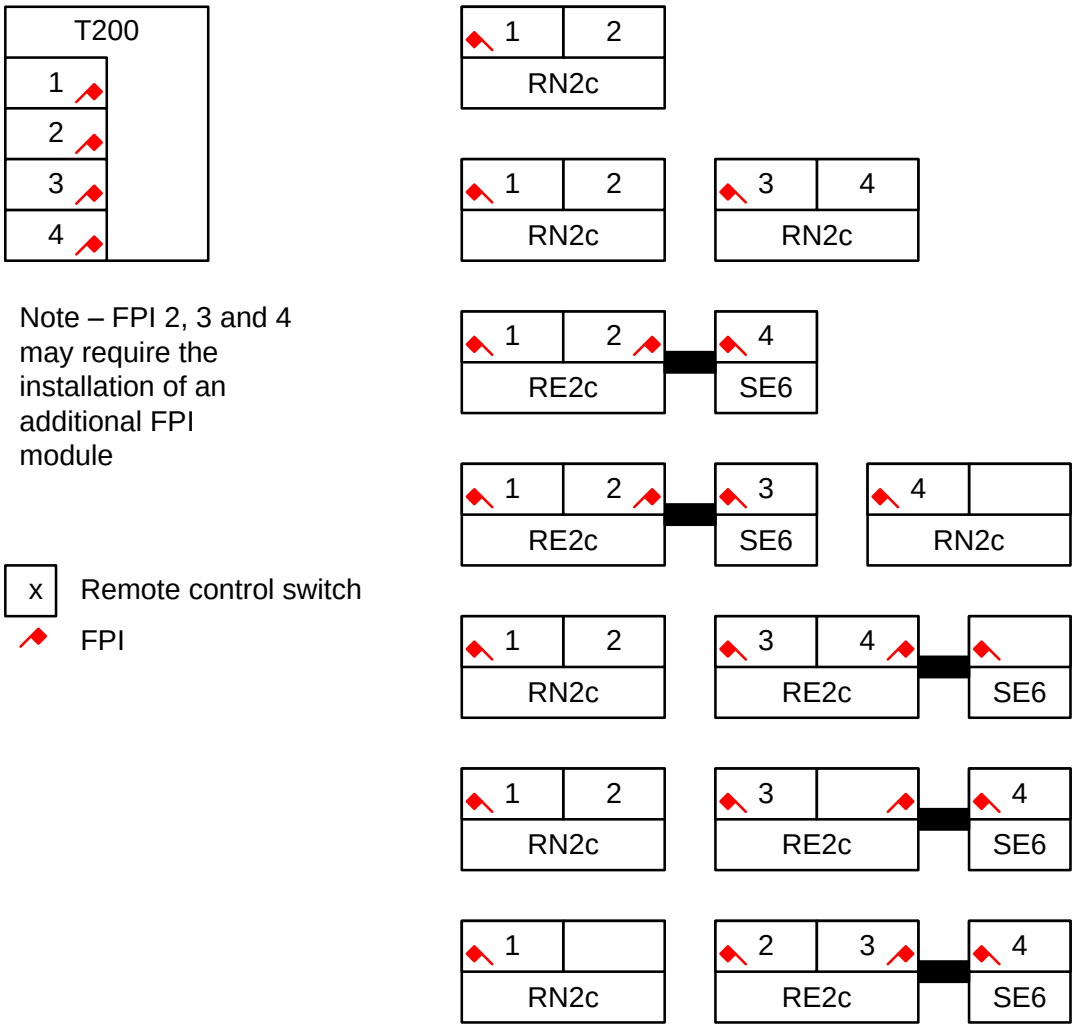

Figure 9-1 – Schneider Switchgear Configurations

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9.2 The Gemini can control up to three switches or circuit-breakers at a location. The diagrams shown in Figure 9-2 provide examples of the various remote control options.

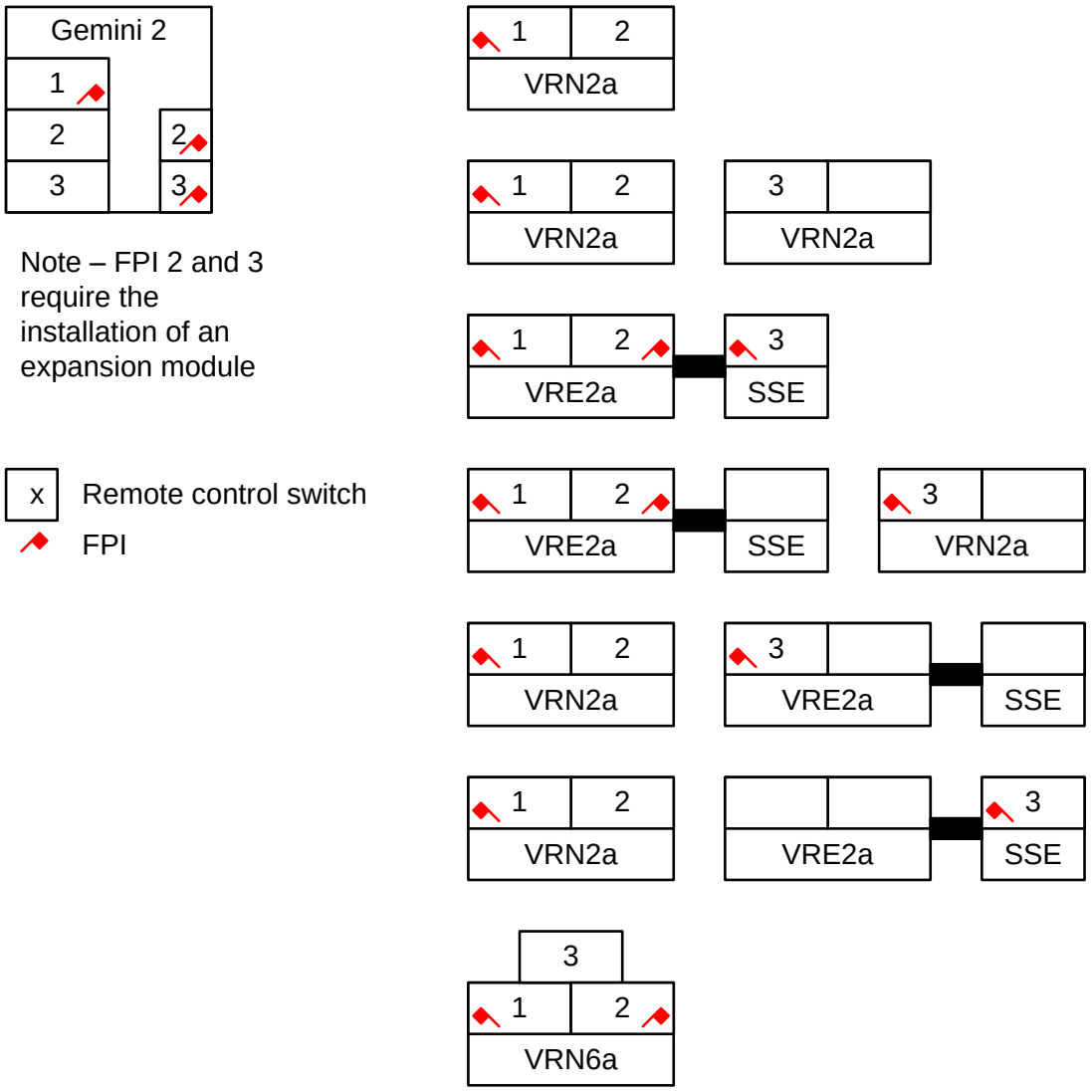

Figure 9-2 – Lucy Switchgear Configurations

9.3 A mixture of Schneider and Lucy switchgear should be avoided at a site. If it is necessary to install both makes of switchgear then remote control should be limited to one make only to avoid the installation of both a T200E and a Gemini on the site.

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10 Mains Supply

10.1 General

10.1.1 The type of mains supply will depend on the actual installation and the type of low voltage supply available at the substation. However, it is important to ensure that the supply is reliable and robustly installed as it will not only power the remote control equipment and keep the battery charged but it will also give indication of the availability of supply to a substation, thus providing useful information to aid fault restoration.

Caution: **All work to facilitate a low voltage supply for a control unit is covered by UK Power Networks Distribution Safety Rules.**

10.1.2 Suitable procedures for installing the mains supply for the various low voltage options below and detailed in the sections that follow.

- LV transformer-mounted fuse cabinet.
- LV pillar.
- LV main (switching stations).
- Consumer unit (indoor substations).
- HV metering unit (HV customers and switching stations).

10.2 LV Transformer-mounted Fuse Cabinet

10.2.1 Install a 2.5mm^2 steel-wire armoured cable between the transformer-mounted fuse-cabinet and the control unit. To avoid a parallel earth path the armouring shall only be earthed at the control unit end with a suitable gland, the transformer-mounted fuse-cabinet end should be secured in a plastic gland.

10.2.2 The transformer-mounted fuse-cabinet should be inspected and assessed for the availability of an auxiliary supply; typically a fused supply is available at a connection block in the bottom of the cabinet but other options especially in older equipment may need to be considered.

10.2.3 A fused auxiliary supply should be confirmed as live and un-switched (for example via the cabinet door switch). The auxiliary supply fuse should be proved and the appropriate fuse way noted.

10.2.4 The standard transformer-mounted fuse-cabinet (Schneider) provides for an easy connection of a 6A fused auxiliary supply for automation (H2-H5 'External Lighting' – refer to Figure 10-1). **This auxiliary supply source should be the preferred option for the control unit on all new installations.**

10.2.5 The supply fuse and terminal block should be clearly labelled 'CAUTION – Automation Supply' so as to avoid inadvertent disconnection.

10.2.6 A list of materials to assemble this supply arrangement is detailed in Appendix E.

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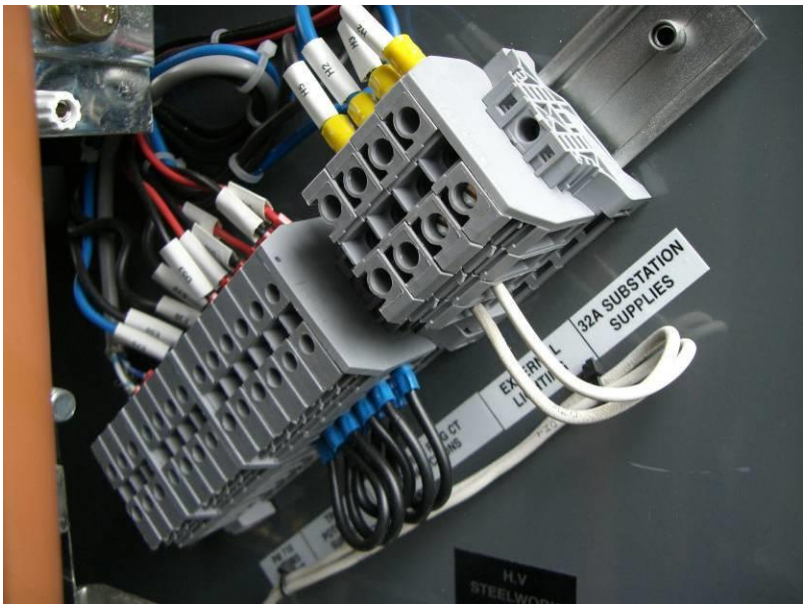

Figure 10-1 – Transformer-mounted Cabinet Auxiliary Supply Terminal Block

10.3 LV Pillar

10.3.1 Install a 2.5mm^2 steel-wire armoured cable between the transformer-mounted fuse-cabinet and the control unit. To avoid a parallel earth path the armouring shall only be earthed at the control unit end with a suitable gland, the LV pillar end should be secured in a plastic gland. Any unused cores should be made safe and left as spare.

10.3.2 The supply to the automation should be connected to the existing LV auxiliary supply; either directly from an existing spare auxiliary fuse (fused at 5A or less) or via a metal-clad fused-spur (fused at 3A), mounted securely in the pillar and supplied directly from an auxiliary supply within the pillar.

10.3.3 Label the fused spur or auxiliary fuses 'CAUTION - Automation Supply' using a suitable label so as to avoid inadvertent disconnection.

10.3.4 The connection of an auxiliary supply from an existing pillar should be subject to both careful consideration and any proposed method of working subject to a detailed site specific risk assessment.

10.3.5 A list of materials to assemble this supply arrangement is detailed in Appendix E.

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10.4 LV Main (Switching Stations)

10.4.1 Where no LV supply is available from a transformer-mounted fuse cabinet, LV pillar or existing domestic wiring within a substation building then a new service with a minimum capacity of 16A shall be installed. Typically this will require a new service from a passing LV main but in some circumstances considerably more work maybe involved.

10.4.2 If the substation is outdoors the new service should be terminated using a street lighting pillar. The street lighting pillar should contain an un-switched spur for the control unit and a socket outlet as shown in Figure 10-2. A standard 'Danger' notice shall be attached to the pillar.

Figure 10-2 – Mains Supply using a Street Lighting Pillar

10.4.3 If the substation is indoors, including a GRP enclosure, the new service should be mounted onto a meter-board securely fitted to the structure. The opportunity should be taken to fit an un-switched spur for the control unit and a socket outlet as a minimum. A list of materials to assemble such a supply arrangement is shown in Appendix E.

10.4.4 Install a 2.5mm^2 steel-wire armoured cable between the street lighting pillar and the control unit. To avoid a parallel earth path the armouring shall only be earthed at the control unit end with a suitable gland. The street lighting pillar end should be secured in a plastic gland. Any unused cores should be made safe and left as spare.

10.4.5 Label the un-switched spur 'CAUTION - Automation Supply' using a suitable label to avoid inadvertent disconnection.

10.4.6 A list of materials to assemble this supply arrangement is detailed in Appendix E.

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10.5 Consumer Units (Indoor Substations)

10.5.1 Where an indoor substation has existing domestic supply available then these should be adapted to provide an un-switched metal clad spur adjacent to the control unit. Wherever possible the supply for the control should be wired as a separate circuit from the local consumer unit and protected by a 3A fuse in the spur with appropriate circuit protection at the consumer unit.

10.5.2 Label the un-switched spur 'CAUTION - Automation Supply' using a suitable label so as to avoid inadvertent disconnection.

10.5.3 A list of materials to assemble this supply arrangement is detailed in Appendix E.

10.6 HV Metering Unit (HV Customers and Switching Stations)

10.6.1 An alternative option for use at HV customer sites or switching stations is to use a HV metering unit. An 110V supply can be taken from the metering unit auxiliary supply terminals to power the control unit.

Note: The T200E control unit requires the installation of an 110V input transformer (available from Schneider) to facilitate this. The original 230V input transformer should be left in the control unit for future use.

11 Earthing

11.1 If the control unit is mounted onto a wall or free standing frame then it shall be suitably bonded to the substation earthing using minimum of 35mm^2 stranded aluminium or 16mm^2 stranded copper PVC covered earth cable as specified in ECS 06-0023.

11.2 If the control unit is mounted onto the switchgear the installed control unit bonding braid shall be securely attached to the switchgear earth.

11.3 The mains supply cable shall be earthed at the control unit end only (and not at the supply end). The earth shall be insulated at the other end.

12 Labelling

12.1 If the control unit is controlling more than one switchboard at a location then the door of control unit should be clearly labelled as shown in Appendix F.

12.2 Each switch in the control unit shall be clearly labelled to indicate which circuit it is controlling as shown in Appendix F.

13 Final Checks

13.1 Check that:

- The cabinet is secure.
- The mains supply is complete.
- The earthing is complete.
- The correct labels are fitted.

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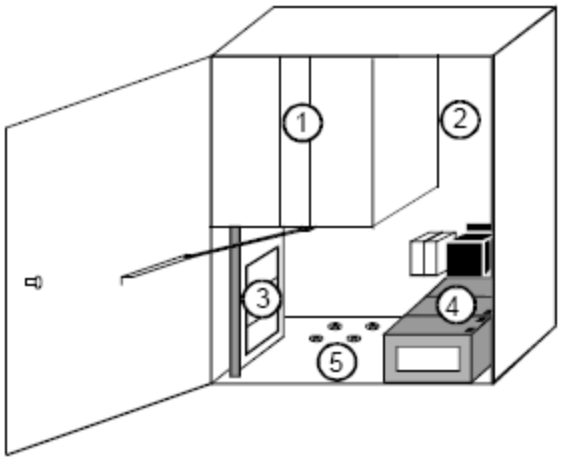
Appendix A – Control Unit Details

A.1 Schneider T200E

The Schneider T200E has remote control facilities for up to four switches or circuit-breakers (or a mixture of both). The cabinet layout is shown below and consists of the following elements:

- Control module (left card), Comms module (middle card) and Power module (right card).
- Space for Paknet pad etc.
- Switchgear interface module.
- Batteries, power supply transformer and mains MCB.
- Cable glands for cable entry.



For further information refer to the relevant commissioning procedure.

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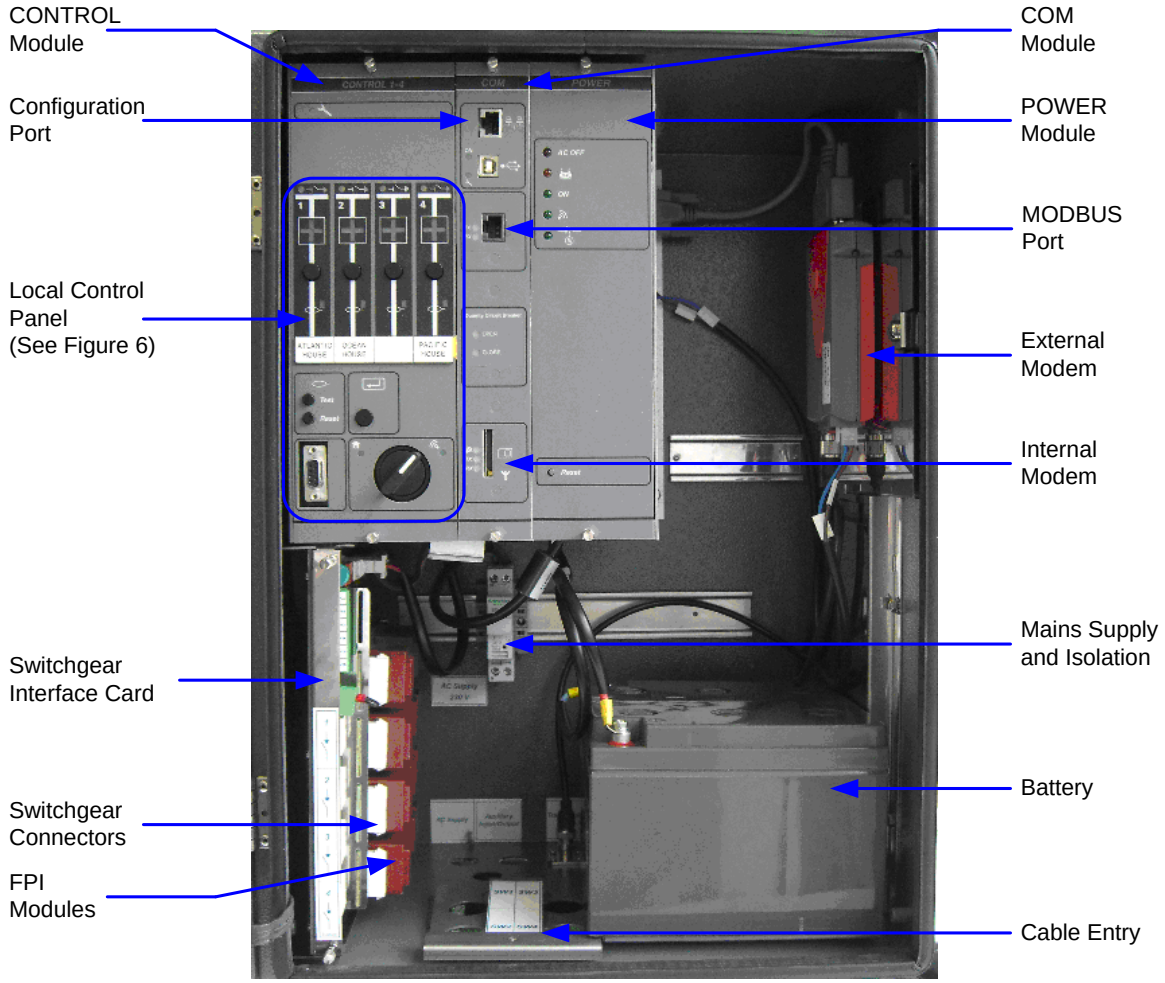
A.2 Schneider T200E Series 3

The T200E can be used to control Schneider switchgear (with rotary and/or linear actuators) and other switchgear via the standard secondary switchgear telecontrol interface. The T200E can also be used to control retrofit actuators on legacy oil switchgear using an additional interface card. Each switch to be controlled needs an umbilical cable connection to the T200E. For further information refer to the relevant commissioning procedure.



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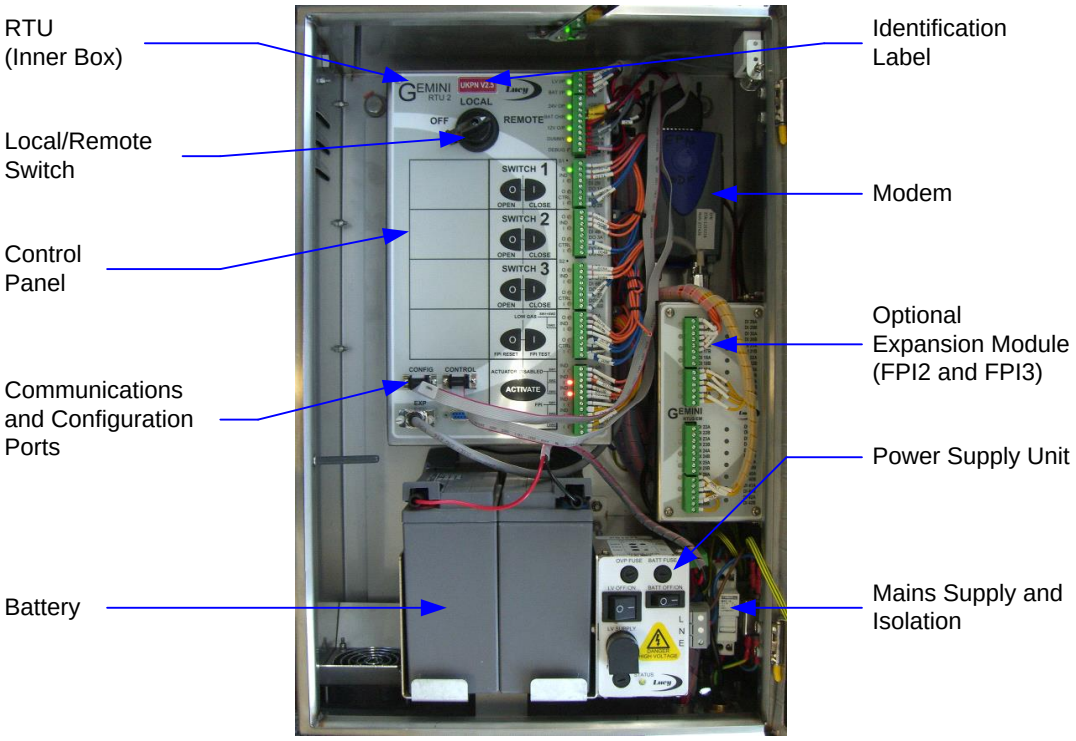
A.3 Lucy Gemini

The Gemini has remote control facilities for up to three switches or circuit-breakers (or a mixture of both). Each switch to be controlled needs an umbilical cable connection to the Gemini. The cabinet layout is shown below. For further information refer to the relevant commissioning procedure.



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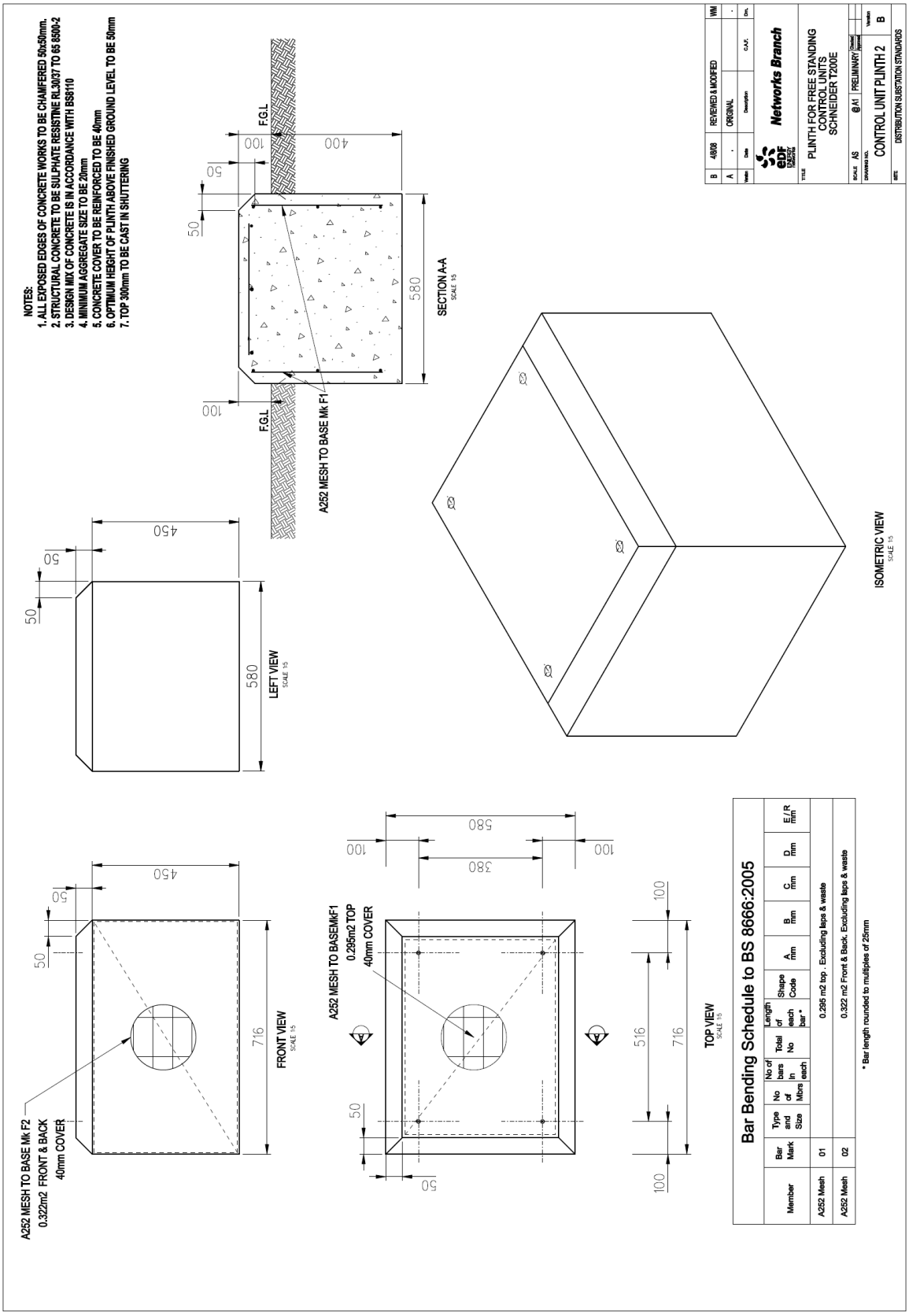
Appendix B – Plinth Drawings

B.1 Schneider T200E Plinth



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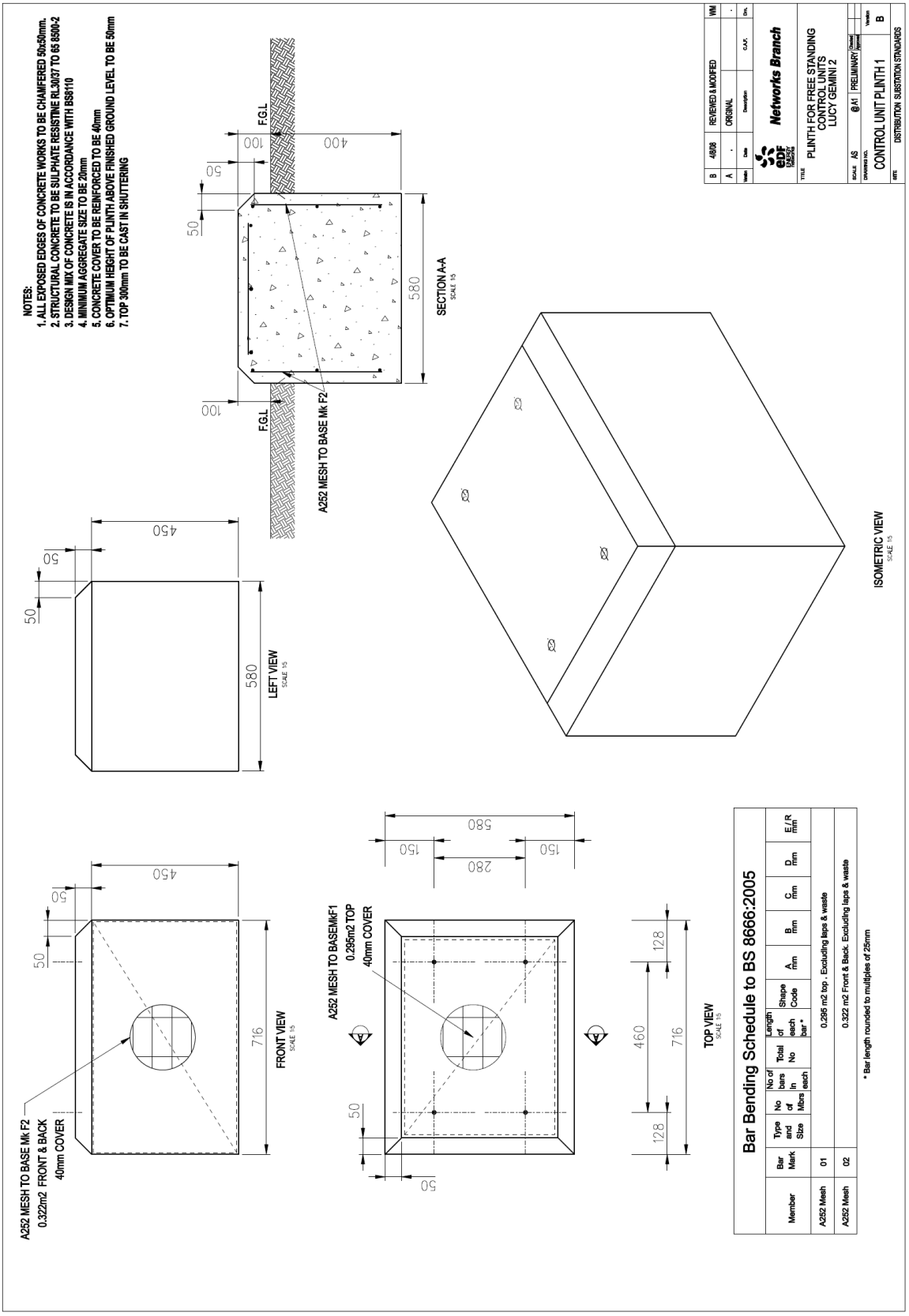
B.2 Lucy Gemini Plinth


NOTES:
1. ALL EXPOSED EDGES OF CONCRETE WORKS TO BE CHAMFERED 50x50mm.
2. STRUCTURAL CONCRETE TO BE SULPHATE RESISTING RL30/37 TO 65 8500-2
3. DESIGN MIX OF CONCRETE IS IN ACCORDANCE WITH BS8110
4. MINIMUM AGGREGATE SIZE TO BE 20mm
5. CONCRETE COVER TO BE REINFORCED TO BE 40mm
6. OPTIMUM HEIGHT OF PLINTH ABOVE FINISHED GROUND LEVEL TO BE 50mm
7. TOP 300mm TO BE CAST IN SHUTTERING
F.G.L
A252 MESH TO BASE Mk F2
SECTION A-A
SCALE 1:5
LEFT VIEW
SCALE 1:5
ISOMETRIC VIEW
SCALE 1:5
A252 MESH TO BASE Mk F2
0.322m2 FRONT & BACK
40mm COVER
FRONT VIEW
SCALE 1:5
A252 MESH TO BASEMkF1
0.295m2 TOP
40mm COVER
TOP VIEW
SCALE 1:5
Networks Branch
PLINTH FOR FREE STANDING CONTROL UNITS LUCY GEMINI 2
CONTROL UNIT PLINTH 1
DISTRIBUTION SUBSTATION STNDARDS
Bar Bending Schedule to BS 8666:2005
Member
Bar Mark
Type and Size
No of Mbrs
No of bars in each
Total No
Length of each bar*
Shape Code
A mm
B mm
C mm
D mm
E/R mm
A252 Mesh 01
0.295 m2 top . Excluding laps & waste
A252 Mesh 02
0.322 m2 Front & Back. Excluding laps & waste
* Bar length rounded to multiples of 25mm

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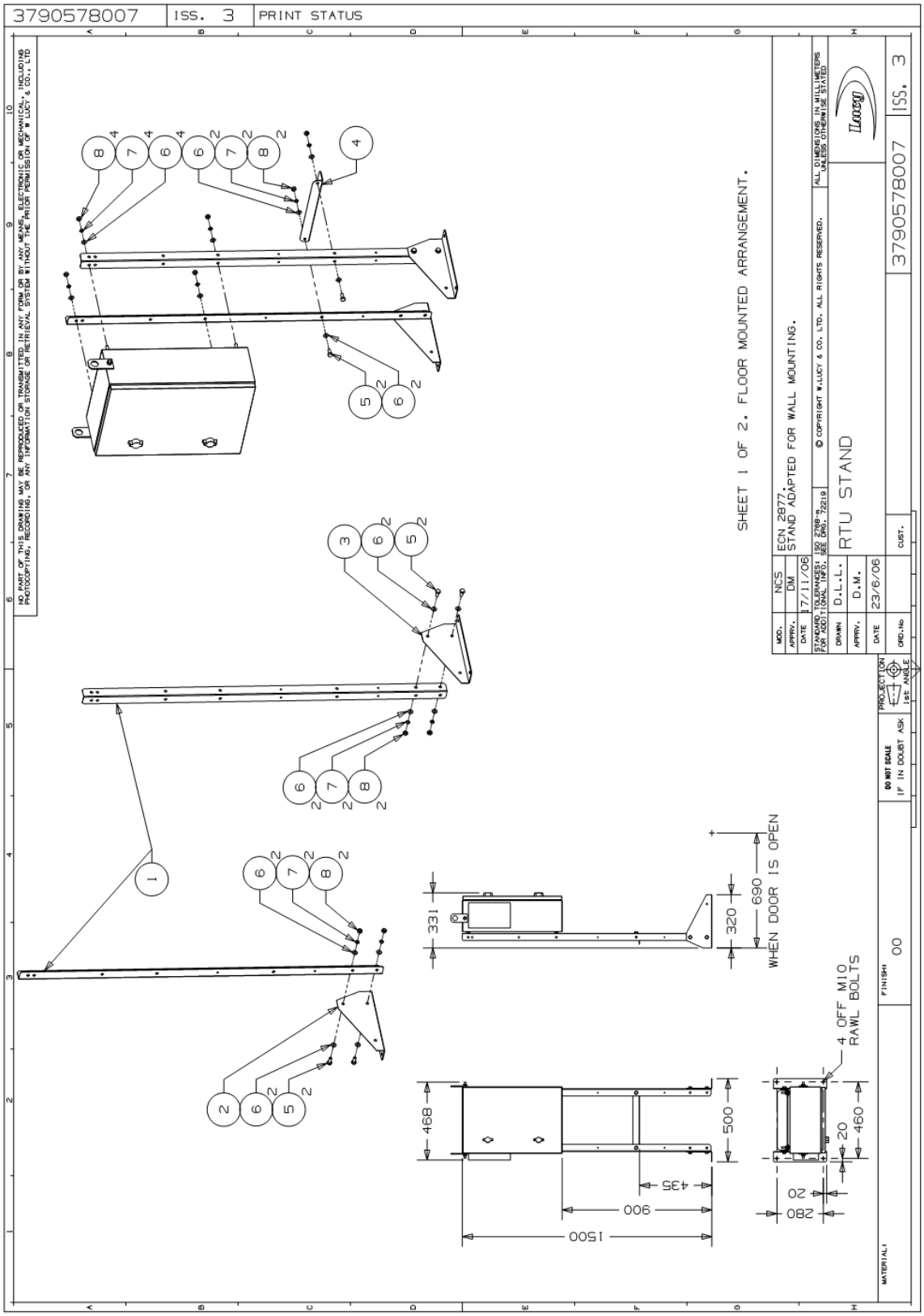
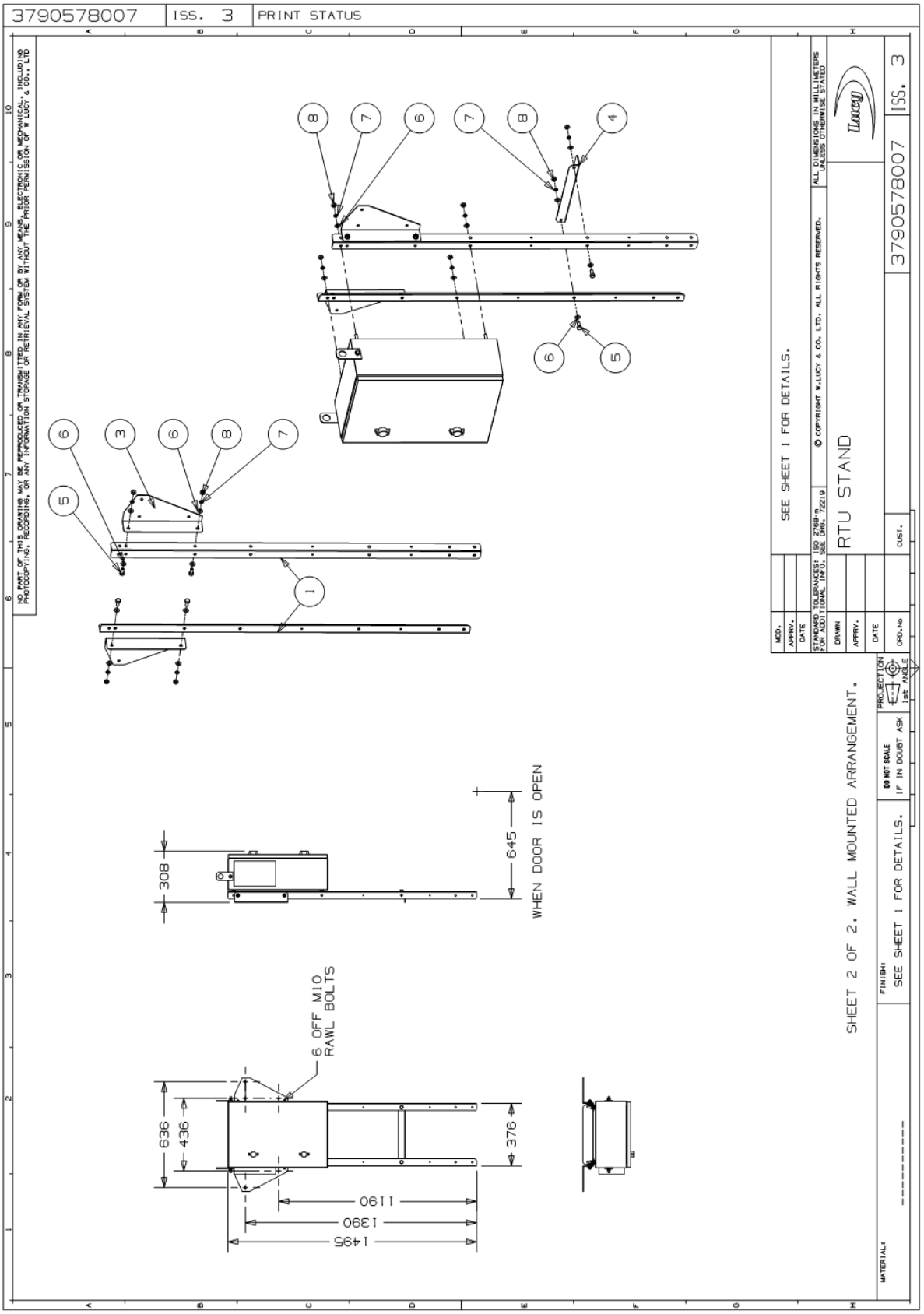
Appendix C – Stand Drawings

C.1 Lucy Gemini Stand used for Ground Mounting

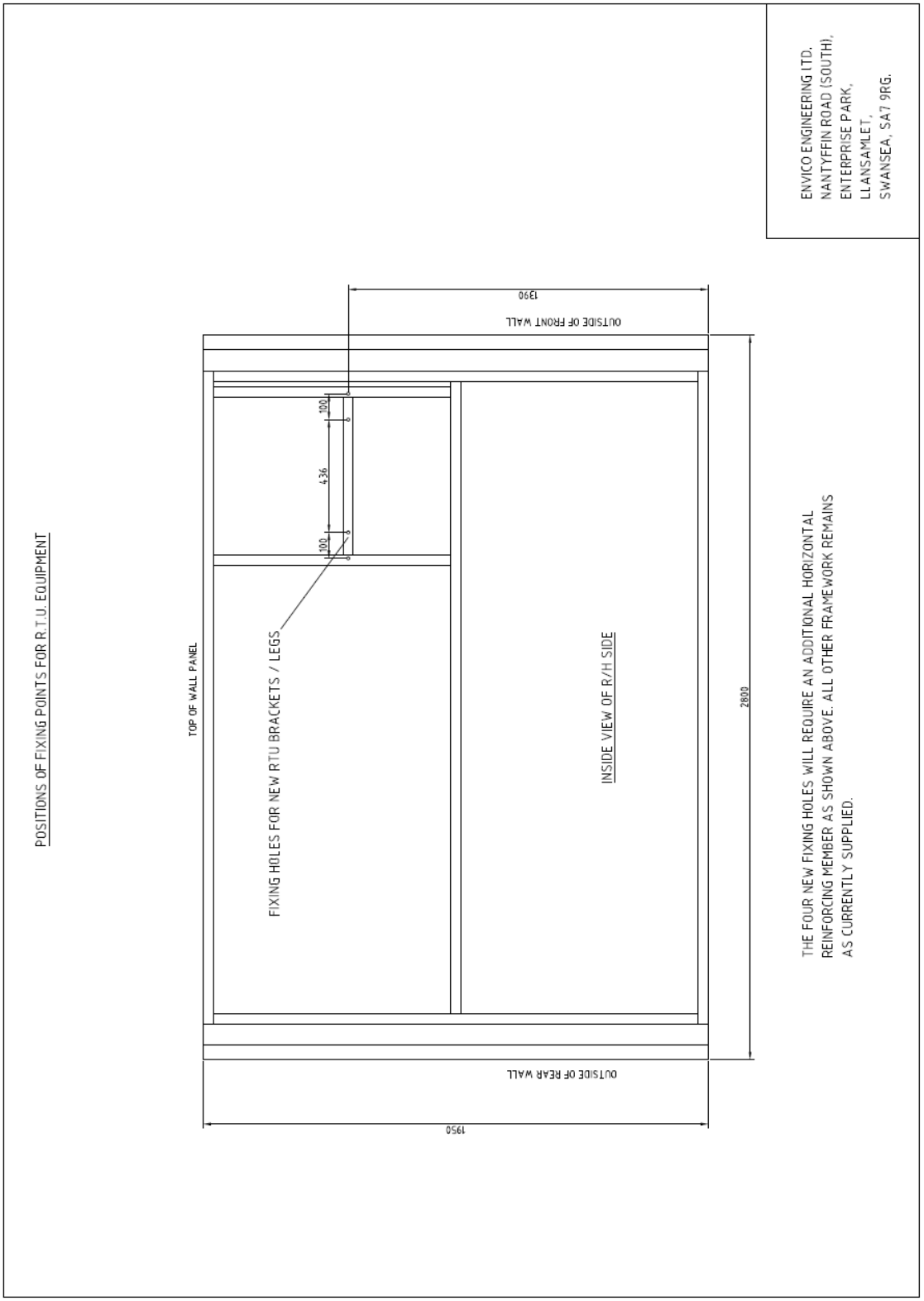


C.2 Lucy Gemini Stand used for Wall Mounting (e.g. GRP)



Appendix D – GRP Mounting Arrangements

D.1 GRP RTU Fixing Drawing



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D.2 Lucy Gemini GRP Mounting Arrangements

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Appendix E – Material Lists

E.1 Auxiliary Supply Components

List of useful items to assist in the installation of control unit auxiliary supplies.

Category	Item	Materials Code[1]
Pillar	Street Lighting Pillar 1010 x 160 x 170mm	33724D
	Street Lighting Pillar 1010 x 210 x 170mm	33725N
Sockets and Spurs	Metal-clad 13A fused spur	01295W
	Metal-clad single socket outlet	05362R
	Metal-clad double socket outlet	05363B
Fuses	5A BS 1362 fuse	11116F
	6A busman fuse (for TOC)	11432G
Cable	4-core SWA 2.5mm^2 cable	05971L
	2.5mm^2 flex cable	Procure locally
	70mm^2 earth cable	05865J
Glands	Brass gland (for SWA cable)	03601T
	Plastic gland	03605H
	Plastic gland	03606S
Zip Ties	Zip tie 2.5mm x 100mm	03552P
	Zip tie 3.5mm x 200mm	03551E
	Zip tie 3.5mm x 300mm	02232U
	Zip tie 4.5mm x 150mm	03550U
	Zip tie 7.5mm x 375mm	02234P
Crimps	Crimp terminals blue	03026P
	Crimp rings 6mm hole blue	14450S
	Crimp rings 6mm hole yellow	14451C
Miscellaneous	Anchor bolts for switchgear	13046H

[1] UK Power Networks Logistics materials code for internal use only.

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E.2 Automation Components

The tables below contain a summary of the key components that maybe required as replacements/spares or to facilitate the addition of remote control to new or existing switches or circuit breakers.

Table E-1 – RTU and Mounting Kits

Item	**Materials Code[2] (Supplier Reference)**	
	EPN	**SPN**
Schneider T200 E04M RTU	14940W[3]	48761H[4]
Schneider T200 mounting kit – RN2c/RE2c/RN6c	48770G (RMR A406)	48770G (RMR A406)
Schneider T200 mounting kit – SE6/CE6	48771R	48771R
Schneider T200 mounting kit – freestanding	48772B (RMR A220)	48772B (RMR A220)
Lucy Gemini RTU	Supplied with ring main unit	
Lucy Gemini Stand	Supplied with ring main unit	

Table E-2 – Schneider Ring Main Unit (RN2c, RN6c and RE2c) Components

Item	**Materials Code[2] (Supplier Reference)**		
	Ring Switch 1 (RSW1)	**Ring Switch 2 (RSW2)**	**Circuit Breaker (CB)**
Rotary actuator	48777A (RMR A507)		
Motor off alarm	48800D (RMR A608)	48801N (RMR A609)	48802X (RMR A520)
Auxiliary switch	48779U (RMR A606)	48778K (RMR A607)	
2.5m conduit	48783U (RMR F377)	48787J (RMR F378)	48791J (RMR F379)
5m conduit	48810M	48788T	48792T
10m conduit	48785P	48789D	48793D
Data acquisition card[5]	48773L (T200AC)		

Refer to Schneider RN2c-RN2-SE6-CE6 OEM Actuators Installation Instructions for further information on installing actuators, motor off alarms and auxiliary switches.

[2] UK Power Networks Logistics materials code for internal use only.
[3] T200 E04M software version 3.03 including T200AC, Paknet aerial bracket, Paknet power lead, Paknet serial cable and Paknet internal aerial fly-lead.
[4] T200 E04M software version 4.01 including T200AC Paknet aerial bracket, Paknet power lead, Paknet serial cable and Paknet internal aerial fly-lead.
[5] The T200E is supplied with one T200AC data acquisition card fitted.

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Table E-3 – Schneider Extensible Switches (SE6) and Circuit-Breaker (CE6/CE2) Components

Item	**Materials Code[6] (Supplier Reference)**	
	SE6	**CE2/CE6**
Linear actuator	48776Q	48776Q
1.145m conduit		48816V (RMR F433)
5m conduit	48795X (RMR F244)	48817F (RMR F562)
10m conduit	48796H (RMR F245)	48818Q (RMR F563)
Data acquisition card	48773L (T200AC)	

Refer to Schneider RN2c-RN2-SE6-CE6 OEM Actuators Installation Instructions for further information on installing actuators, motor off alarms and auxiliary switches.

Table E-4 – Lucy Components

Item	**Materials Code[6] (Supplier Reference)**
	VRN2a/VRN6a
10M Umbilical Cable	13939W
5M Umbilical Cable	13940S (X080000150)
Actuator Kit including Interface PCB	13941C (THM0001329)
Gemini 2.5 FPI Expansion Module	13937C (X0204215AO)
Gemini 2.5 PSU	13936S
Gemini 2.5 L12V15 Battery (set of 2)	13938M
FPI CT Shorting PCB	13942M
Switchgear Simulator	13943W

Table E-5 – Paknet[7] Components

Item	**Materials Code[6]**	
	EPN	**SPN**
Paknet pad	61525V	47412W
Paknet aerial	61532A	
N-type aerial plug	01688X	

[6] UK Power Networks Logistics materials code for internal use only.
[7] Refer to EOS 05-9201 (Paknet communication system) for further information.

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Appendix F – Labels

F.1 Control Unit Door Label for Multiple Switchboards

If a control unit controls more than one switchboard a warning label (approx size 300mm x 150mm) shall be fixed onto the front of the as shown below.

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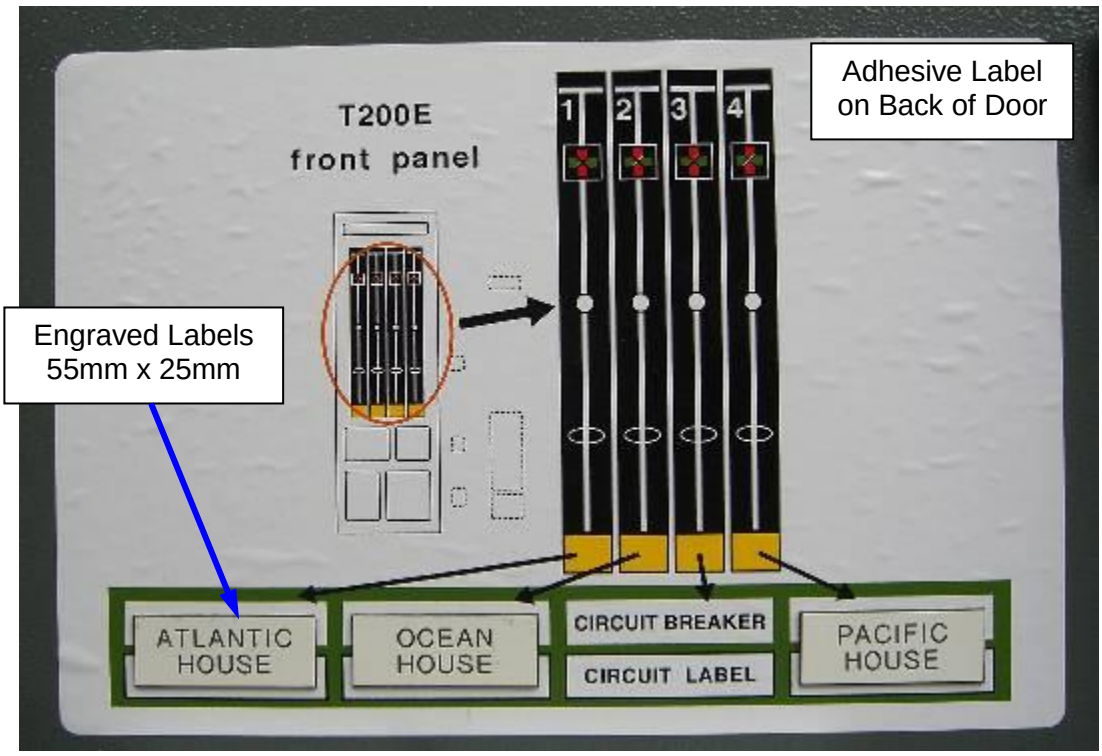
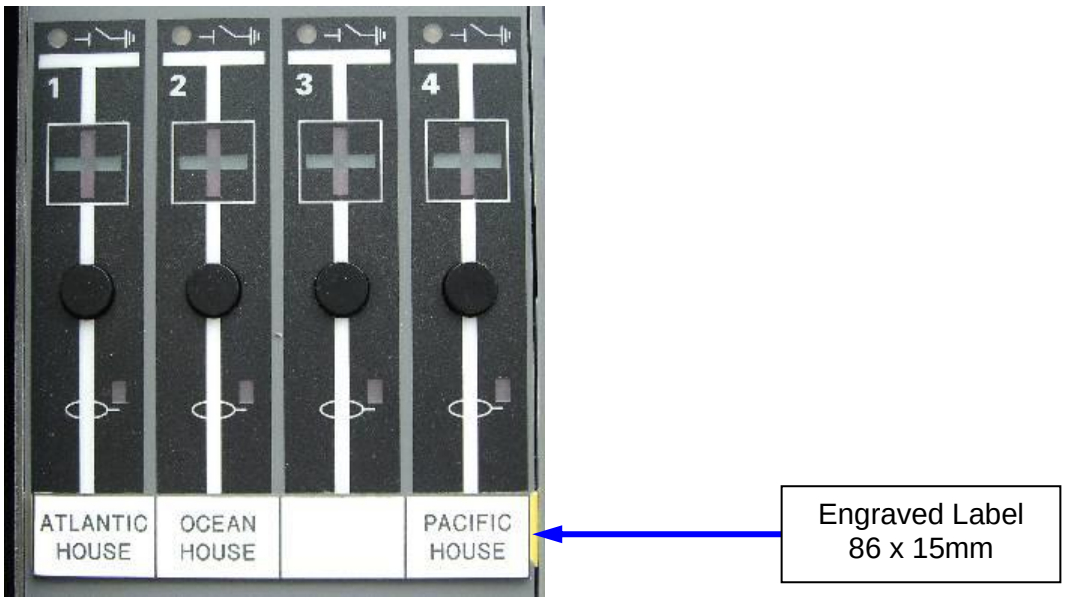
F.2 T200E Circuit Label

The label shown below is provided on the inside of the door on a T200E and is supplied on all EPN and SPN units from September 2008. Spare labels for use on older stock are available from Schneider Electric.

Engraved circuit labels of size 55mm x 25mm shall be added for each switch/circuit-breaker in use as shown below.



Another engraved label of size 86 x 15mm (with four equal sections) showing all circuits shall be placed over the yellow paper strip as shown below.



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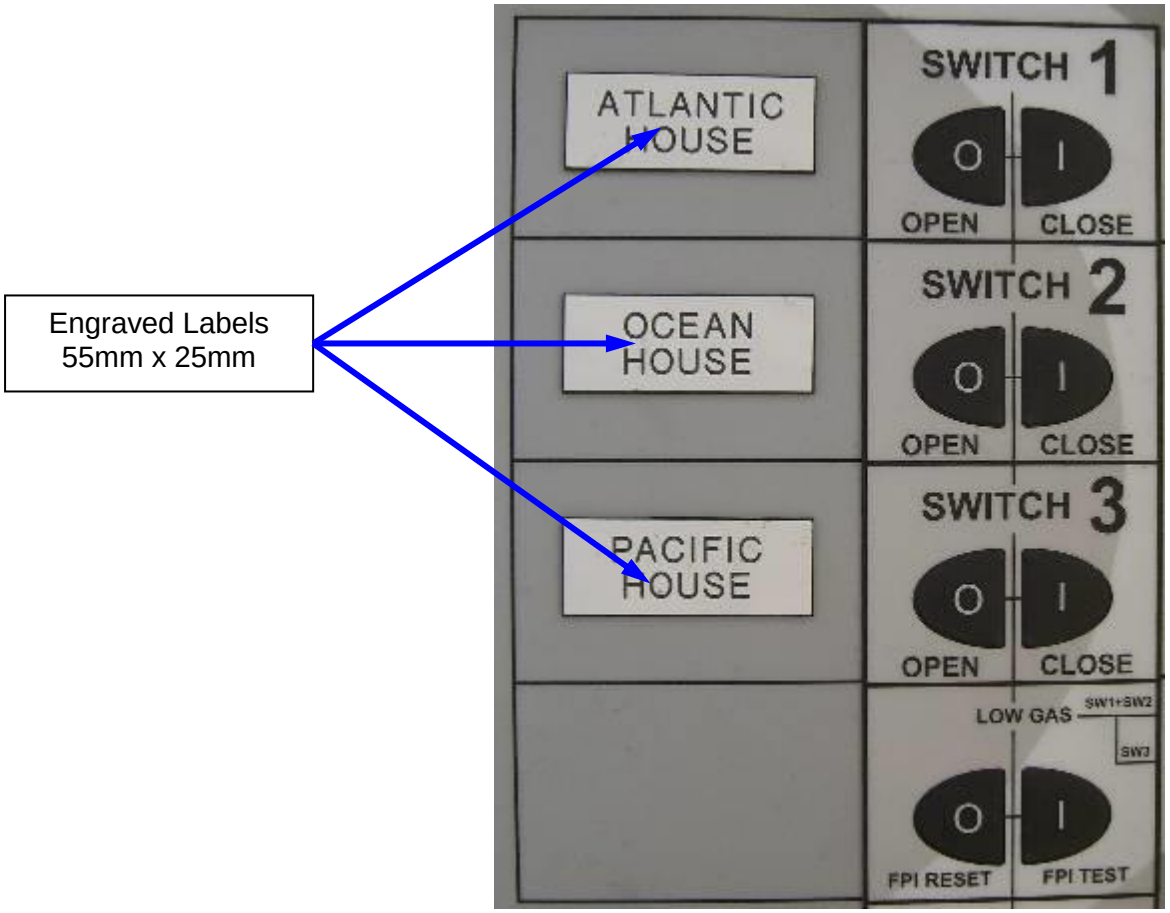
F.3 Gemini Circuit Label

Engraved circuit labels of size 55mm x 25mm shall be added for each switch in use as shown below.



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